

# Cognitive abilities, self-efficacy, and financial behavior

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## 1. Motivation

The older population in the United States has increased dramatically, and more than 20% of the overall U.S. population is predicted to be aged 65 and above by the year 2030 (Johnson, 2020). This older population is taking greater responsibility for managing a substantial amount of wealth accumulated throughout the lifetime. However, evidence from aging literature indicates that cognitive abilities decline sharply after age 60 (Plassman et al., 1995; Finke, Howe, and Huston, 2017). The cognitive ability deterioration could make older adults vulnerable to financial management inefficiency, which not only affects the well-being of older adults in the last period of their lives but also has wide-ranging implications on society (Agarwal et al., 2009; Korniotis and Kumar, 2011; Agarwal and Mazumder, 2013).

How will cognitive aging, a normal and inevitable consequence of biological aging, affect the financial well-being of the older population? To answer this question, we not only need to examine the role of cognitive abilities in determining financial behavior among older adults, but also to understand the underlying mechanisms of the cognitive effects. Yet, despite the growing salience of the issue, our understanding of how cognitive abilities affect financial behavior among older adults is limited.

Cognitive abilities can influence financial behavior among older adults through two channels: *ability* and *self-efficacy*. The *ability* channel refers to the ability required for optimal financial decision making such as information retrieval, processing and integration, mathematical calculation, and problem analysis and solving, all of which are largely determined by cognitive abilities. For example, memory, a critical

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component of cognitive ability measure, is related to numeracy, information processing ability, conditional probability judgments and financial knowledge acquisition (Spaniol and Bayen, 2005; Korniotis and Kumar, 2011; Gamble et al., 2015). Other cognitive functioning such as mathematical, verbal, recall, and logical skills contributes to stock market participation and portfolio choice decisions (Christelis et al., 2010; Grinblatt et al., 2011). Bruine de Bruin et al. (2012) also points out that decreased fluid cognitive ability in old age is linked to worse performance on tasks that require reasoning, pattern recognition and problem solving. Thus, heterogeneity in individual cognitive abilities is expected to explain differences in financial outcomes.

In regard to the *self-efficacy* channel, individual cognitive abilities and consequent accomplishments can significantly affect one's belief in his or her ability to control and influence various aspects of life, namely, self-efficacy. For example, in the process of reappraising capacities in old age, witnessing weakening memory, mathematical, analytical, and attentional abilities as well as the failure to accomplish tasks due to cognitive aging can potentially exert negative impact on one's sense of self-efficacy (Bandura 1977; Lippke, 2017). Self-efficacy could in turn exert significant effect on financial behavior. People with lower self-efficacy expect less benefit from making efforts in the present, show less persistence in the face of adverse experiences, and thus achieve fewer financial goals and undergo a lower quality of financial decisions (Bandura, 1986, 1991, 1994; Lippke, 2017; Kuhnen and Melzer, 2018; Asebedo and Payne, 2019). Therefore, in this secondary *self-efficacy* channel, cognition exerts a positive effect on self-efficacy, and self-efficacy also significantly affects financial behavior.

Although previous studies have provided evidence on the effect of cognitive abilities on financial behavior, the underlying mechanism of the cognitive ability effect and the interplay of cognitive and noncognitive skills in determining financial behavior is underexplored. To better assist the older population through the cognitive aging process, it is particularly important to understand the ways cognitive abilities work on financial behavior. For example, previous studies mainly focused on financial

capability deterioration; thus, policy options to address the identified problems are mainly on financial education and outsourcing financial decisions to professional financial advisors (Agarwal et al., 2009; Gamble et al., 2015; Finke et al., 2017). If older people suffer from worse financial outcomes not only due to declining cognitive abilities but also because they lose belief in their abilities and, therefore, stop making an effort to manage their finances, then efforts to build individuals' noncognitive skills, such as self-efficacy, along with educational programs and professional advisory service can lead to more effective outcomes.

In addition, the emerging literature that links noncognitive skills to household financial decisions has highlighted the significant influence of psychological traits on financial behavior. Although a wide range of noncognitive skills have been studied, self-efficacy—the fundamental perception that individuals hold about their abilities to influence various aspects of life—has received limited investigation in regard to its association with financial behavior. It is necessary to fill in the gap in the literature by investigating the effect of self-efficacy, as well as the interplay of cognitive abilities and self-efficacy in determining wide ranging financial behavior. What is more important, by losing the belief in one's ability, many aspects of life, not only the financial affairs, could be negatively affected. Thus individual sense of self-efficacy, especially how it evolves with cognitive aging among older adults, warrants attention.

## 2. Main analysis and key findings

This study uses the longitudinal dataset provided by the Health and Retirement Study (HRS), a nationally representative multi-disciplinary study of Americans over age 50 (Sonnegga et al., 2014). I combine HRS surveys in areas of cognition, psychosocial characteristics, and financial behavior during the period of 2008–2016 and derive a selected sample of 12,750 observations.

I create measures on financial behavior based on six indicators: whether the household had a financial strain in meeting monthly payments; whether the household always had enough money to buy the food needed in the past two years; whether the household fell more than

two months behind on mortgage payments; whether the household held more than one type of financial asset for portfolio diversification; whether the respondent closely followed the stock market; and whether the growth rate of household financial wealth exceeded the median growth rate of the same age group in the past two years. Each of these indicators has a value of 0 or 1. I take the sum of these six indicators to create the “financial behavior” score that ranges from 0 to 6. I also create a “routine tasks” score by adding the first three indicators and an “advanced tasks” score by adding the last three indicators. “Advanced tasks” are expected to have a higher demand for information processing and analytical ability than “routine tasks.”

I adopt the widely used measure of cognitive abilities in the HRS, defined as the sum of the respondent’s immediate and delayed word recall, serial 7s, backwards counting, object naming, president/vice president naming, and date naming tests (McCammon et al., 2019). Respondents were also asked 10 self-efficacy questions that focus on a personal sense of control, in general. I follow Smith et al. (2017) and construct a self-efficacy score based on these 10 questions.

By plotting the financial behavior, cognition and self-efficacy scores by age, I find that the quality of financial decisions declines with age, especially when cohort effects and selection bias are controlled. The same declining pattern is found in cognition and self-efficacy. These results are consistent with the literature on cognitive aging and declining financial outcomes among the older population (e.g., Agarwal et al., 2009; Korniotis and Kumar, 2019).

In the baseline analysis, I use the cognitive score as the main explanatory variable to examine the effect cognitive abilities directly exert on financial behavior. I also control for individual self-efficacy, risk preference, demographic and financial characteristics, including age, gender, ethnicity, marital status, years of school, household income, household wealth, home ownership, employment and retirement status, and local and time fixed effects. It is found that a higher cognitive score is associated with better financial performance. A one-standard-deviation (12.55) increase in cognitive score leads

to a 0.12 increase in the financial behavior score. To quantify the importance of cognitive ability in determining financial behavior, I compare its effect with those of other controls. For example, the coefficient on household wealth (in \$1,000) is 0.0002; a unit increase in cognitive score has the same effect of a \$46,000 increase in household wealth on financial behavior.

The cognition measure based on memory, vocabulary and numeracy tests implies individual ability in information processing and integration, mathematical calculation, and problem analysis. Thus, results above indicate that cognitive abilities directly affect financial behavior through the *ability* channel. To provide further evidence on the *ability* channel, I rerun the regression of cognitive ability effect on financial behavior with two different dependent variables: financial behavior scores in “routine tasks” and “advanced tasks.” That is, I divide financial behavior into two groups based on their degrees of dependence on information processing and problem-solving abilities. If cognitive abilities exert their influence on financial behavior through the *ability* channel, the effects are expected to be stronger among advanced tasks which require more cognitive skills (Christelis et al., 2010). The results show that the effect of cognitive abilities on financial behavior is much stronger among advanced tasks than routine tasks (coef: 0.0018 on routine tasks vs. 0.0074 on advanced tasks). Therefore, it is concluded that cognitive abilities directly affect financial behavior, and the effects are stronger among tasks that demand more information processing and problem-solving abilities, which confirm the presence of the *ability* channel of the cognitive ability effect.

To investigate the potential secondary channels through which cognitive abilities affect financial behavior, I adopt the Blinder-Oaxaca decomposition method (Blinder, 1973; Oaxaca, 1973). Specifically, I select two groups: those with the top centile of cognition score, with a mean financial behavior score of 4.57, and those with the bottom centile of cognition score, with a mean financial behavior score of 3.66. Then, the Blinder-Oaxaca decomposition method is employed to explore how much of the difference in financial behavior (0.91) is explained by the difference in self-efficacy and other

control variables between these two groups. Results indicate that a significant portion of the effects of cognitive abilities on financial behavior, reflected in the performance differences between the two cognition groups, is due to cognition-related self-efficacy. Difference in self-efficacy between the two groups accounts for a 12% difference in financial behavior, holding other control variables fixed. That is, among the possible secondary channels, cognition-related difference in self-efficacy is found to be one of significant importance. It provides empirical support for the value of investigation into the secondary *self-efficacy* channel—cognitive abilities affect self-efficacy, which, in turn, influences financial behavior.

To formally test for the *self-efficacy* channel, two regressions are adopted: first regresses self-efficacy on cognition score with other control variables, and second regresses financial behavior on self-efficacy and cognition score with other control variables. It is confirmed that cognition exerts a positive effect on self-efficacy, which also significantly affects financial behavior. A one-unit increase in the cognition score leads to a 0.19-unit increase in self-efficacy; a one-unit increase in self-efficacy leads to a 0.007 increase in financial behavior. Both effects are statistically significant at 1%. That is, when the older population experiences cognitive aging, they not only lose the cognitive capacity to make optimal decisions, they also suffer from a decline in their belief in their abilities, which also contributes to a decline in financial management efficiency.

In the last step, I adopt the structural equation model to summarize the direct and indirect effects of cognitive abilities on financial behavior. The direct effect represents the direct ability channel, and the indirect effect represents the effect of cognitive abilities through self-efficacy. It is found that both the direct and indirect effects of cognitive abilities are statistically significant at 1% level. In addition, separate analyses of routine tasks and advanced tasks show that the direct effect of cognition through the *ability* channel is much stronger on advanced tasks than on routine tasks, whereas the indirect effect through self-efficacy plays a relatively more

important role in decisions that involve less information processing.

Various robustness tests are run to address the identification problems. For example, I take advantage of the longitudinal dataset and use lagged cognition and self-efficacy measures to examine the influence of reverse causality. I also use a two-stage least-squares (2SLS) regression method, in which respondents' participation in card or word games is used as instrument for cognition, and self-assessment of control in social life is used as instrument for self-efficacy, to investigate the endogeneity bias caused by omitted variables. I adopt first difference estimation to exclude the possibility of bias from family background along with other time-invariant unobserved heterogeneity. I also rerun the analysis using a “financial respondents” subsample to address the issue that a respondent in the sample may not be the one making financial decisions for the household. These robustness tests exclude the possibility that the main results are driven primarily by reverse causality, endogeneity, family background or sample selection bias.

In sum, this paper not only confirms the effect of cognitive abilities on financial behavior but also explains the underlying mechanism. It points out that ability is not the only source of cognitive influence; noncognitive skills also can be affected by cognitive differences and consequently change individuals' financial behavior. In fact, as suggested by the results, self-efficacy effectively improves financial outcomes. Especially among routine tasks that do not require many cognitive skills, improving one's self-efficacy can influence financial outcomes to a larger extent than can simply improving cognitive skills.

### 3. Implications

The findings in this paper call for greater efforts to assist the older population through the cognitive aging process. On the one hand, the rapidly growing older population is taking greater responsibility for managing a substantial amount of wealth that have accumulated over the lifetime. On the other hand, given the inevitable cognitive aging process and the significant role it plays in determining financial outcomes, older adults are

especially vulnerable to financial mistakes. Unfortunately, older adults lack the flexibility in the labor market to compensate for the financial mistakes, and most retirees have fewer regulatory protections than do workers (Agarwal et al., 2009). Policymakers are urged to make a greater effort to assist the older population through the cognitive aging process.

Acknowledging the widespread inefficiency in financial management among older adults, a growing number of studies investigate ways to help them improve. The main focus has been on educational programs, professional advisory services, and helpful nudges targeted at mitigating the negative impacts of deteriorating cognitive abilities (Agarwal et al., 2009; Finke et al., 2017). Results in this study suggest that noncognitive skills, such as self-efficacy, could be another source of

interventions. Educational programs and professional advisory services, complemented by efforts to build individuals' self-efficacy, will likely lead to more effective outcomes.

In addition, due to the dramatic growth in the proportion of older people, there has been heightened interest in improving their quality of life after retirement. Results in this paper point out that cognitive aging could not only lead to performance loss in tasks that require cognitive capacity, but also negatively affects people's belief in their ability to influence various aspects of life. Thus, helping people face cognitive aging should involve a broader set of elements than simply a focus on ability improvement.

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